THE CLAIMS

What is claimed is:

1. A method for transferring a first substrate to a second substrate, which comprises:

molecularly bonding to each other first and second front faces of first and second substrates, respectively, to provide a composite structure, the first and second faces being substantially parallel and corresponding in surface shape, the first front face having a first outline, the second front face having a second outline, and a peripheral side of the second substrate substantially bordering the second front face and being oriented generally perpendicularly with respect thereto, wherein the second outline has dimensions larger than the first outline, such that during bonding at least a portion of the first outline is disposed within the second outline for improving bonding in a region at the periphery of the first front face; and

implanting atomic species in a donor substrate that comprises the first or second substrate to provide a region of weakness for facilitating splitting through the donor substrate.

2. The method of claim 1, wherein the peripheral side is oriented perpendicularly or quasi-perpendicularly with respect to the second front face.

3. The method of claim 1, wherein the at least a portion of the front outline is disposed within the second outline during bonding for minimizing the size of a peripheral region about the first front face within an overlapping area at which the front faces overlap, in which peripheral region the bonding between the faces is weak or absent.

4. The method of claim 1, wherein the peripheral region is less than 0.5 mm wide.

5. The method of claim 1, wherein the first and second substrates comprise a semiconductor material at least at one of the front faces.

6. The method of claim 1, further comprising providing a useful layer from the donor substrate, the useful layer being of a semiconductor material and comprising one of the first or second substrate adjacent the bonded face thereof.

7. The method of claim 6, wherein the useful layer is useful for producing an electronic, optic, or optoelectronic component or substrate.

8. The method of claim 6, further comprising detaching the useful layer from a donor portion of the donor substrate of the composite structure.

9. The method of claim 6, wherein the useful layer is detached by applying electrical or mechanical stress to, supplying thermal energy to, or chemically etching the composite structure, or by combinations thereof.

10. The method of claim 1, further comprising splitting the donor substrate at the region of weakness.

11. The method of claim 1, wherein the first outline is substantially completely disposed within the second outline during the bonding.

12. The method of claim 1, wherein donor substrate comprises the first substrate.

13. The method of claim 1, wherein the donor substrate comprises the second substrate.

14. The method of claim 1, wherein the first substrate comprises a first primary chamfer extending around the first front face and having a primary chamfer outline that is at least partially disposed within the second outline during bonding.

15. The method of claim 14, wherein the primary chamfer outline is disposed substantially entirely within the second outline during bonding.

16. The method of claim 1, wherein the front faces are substantially flat.

17. The method of claim 1, wherein at least one of the front faces comprises an insulator.

18. The method of claim 1, wherein the second front face has a diameter that is at least 0.3 mm greater than the first front face.

19. The method of claim 1, wherein at least one of the substrates is of bulk material.

20. The method of claim 1, wherein the second substrate is substantially free of a primary chamfer between the peripheral side and the second front face thereof.

21. The method of claim 20, wherein the second substrate is substantially free of any chamfer between the peripheral side and the second front face thereof

22. A method for transferring a first crystalline substrate to a second crystalline substrate, comprising:

molecularly bonding to each other first and second round front faces respectively of first and second substrates, the first and second faces being substantially parallel and corresponding in surface shape, wherein the second front face has dimensions larger than the first front face, such that the first front face is disposed within the second front face for improving the bonding near the first front face periphery, and a peripheral side of the second substrate substantially borders the second front face and is oriented generally perpendicularly with respect thereto; and

implanting atomic species in a donor substrate that comprises the first or second substrate to provide a region of weakness for facilitating splitting through the donor substrate.

23. The method of claim 22, wherein the peripheral side is oriented perpendicularly or quasi-perpendicularly with respect to the second front face.

24. The method of claim 22, wherein the diameter of the second substrate is at least 0.3 mm greater than the diameter of the first substrate.

25. A method for transferring a first substrate to a second substrate, which comprises molecularly bonding to each other first and second front faces of first and second bulk substrates, respectively, to provide a composite structure, wherein a peripheral side of the second substrate substantially borders the second front face and is oriented generally perpendicularly with respect thereto, the first and second faces being substantially parallel and corresponding in surface shape, the first front face having a first outline, and the second front face having a second outline, wherein the second outline has dimensions larger than the first outline, such that during bonding at least a portion of the first outline is disposed within the second outline for improving bonding in a region at the periphery of the first front face,.

26. The method of claim 25, further comprising:

creating a region of weakness in a donor substrate that comprises the first or second substrate for facilitating splitting; and

splitting the donor substrate after the bonding at the region of weakness.

27. The method of claim 25, wherein the region of weakness is formed by implantation of atomic species.

28. The method of claim 26, wherein the region of weakness is formed by a porous layer.

29. A composite structure, comprising:

a first substrate having a first front face that has a first outline; and

a second substrate having a second front face that has a second outline of dimensions larger than the first outline, the second substrate having a peripheral side substantially bordering the second front face and oriented generally perpendicularly with respect thereto;

wherein the first and second front faces are molecularly bonded to each other with the first outline disposed at least partially within the second outline in an area of overlap, such that a peripheral ring extending around the first front face within the area of overlap in

which bonding between the front faces is weak or absent has a maximum width of less than 0.5 mm.

30. The composite structure of claim 29, wherein the first substrate comprises:

a zone of weakness; and

a useful layer of semiconductor material disposed between the first front face and the zone of weakness;

wherein the zone of weakness is configured for facilitating splitting the useful layer from a donor portion of the first substrate.